

## Claims

1. A nitride semiconductor comprising:
  - a substrate;
  - a GaN-based buffer layer formed on the substrate in any one selected from a group consisting of a three-layered structure  $\text{Al}_y\text{In}_x\text{Ga}_{1-x-y}\text{N}/\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$  where  $0 \leq x \leq 1$  and  $0 \leq y \leq 1$ , a two-layered structure  $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$  where  $0 \leq x \leq 1$ , and a superlattice structure of  $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$  where  $0 \leq x \leq 1$ ; and
  - a GaN-based single crystalline layer formed on the GaN-based buffer layer.
2. The nitride semiconductor of claim 1, wherein the GaN-based single crystalline layer comprises:
  - an indium-doped GaN layer;
  - an undoped GaN layer formed on the Indium-doped GaN layer; and
  - a silicon-doped n-GaN layer formed on the undoped GaN layer.
3. The nitride semiconductor of claim 1, wherein the GaN-based single crystalline layer comprises:
  - an undoped GaN layer;
  - an indium-doped GaN layer formed on the undoped GaN layer; and
  - a silicon-doped n-GaN layer formed on the indium-doped GaN layer.
4. A nitride semiconductor light emitting device comprising:
  - a substrate;
  - a GaN-based buffer layer formed on the substrate in any one selected from a group consisting of a three-layered structure  $\text{Al}_y\text{In}_x\text{Ga}_{1-x-y}\text{N}/\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$  where  $0 \leq x \leq$

1 and  $0 \leq y \leq 1$ , a two-layered structure  $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$  where  $0 \leq x \leq 1$ , and a superlattice structure of  $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$  where  $0 \leq x \leq 1$ ;

a first electrode layer of an n-GaN layer formed on the GaN-based buffer layer;

an activation layer formed on the first electrode layer; and

a second electrode layer of a p-GaN layer formed on the activation layer.

5. The nitride semiconductor light emitting device of claim 4, further comprising:

an Indium-doped GaN layer formed on the GaN-based buffer layer; and

an undoped GaN layer formed on the Indium-doped GaN layer.

6. The nitride semiconductor light emitting device of claim 4, further comprising:

an undoped GaN layer formed on the GaN-based buffer layer; and

an Indium-doped GaN layer formed on the undoped GaN layer.

7. A method for fabricating a nitride semiconductor, the method comprising the steps of:

(a) growing a GaN-based buffer layer on a substrate in any one selected from a group consisting of a three-layered structure  $\text{Al}_y\text{In}_x\text{Ga}_{1-x-y}\text{N}/\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$  where  $0 \leq x \leq 1$  and  $0 \leq y \leq 1$ , a two-layered structure  $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$  where  $0 \leq x \leq 1$ , and a superlattice structure of  $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$  where  $0 \leq x \leq 1$ ; and

(b) growing a GaN-based single crystalline layer on the grown GaN-based buffer layer.

8. The method of claim 7, wherein the GaN-based buffer layer is grown in an MOCVD equipment at a temperature of 500 - 800 °C and in a thickness of 50 - 800 Å by introducing sources of TMGa, TMin and TMAI and a gas of NH<sub>3</sub> at the same time while supplying carrier gases of H<sub>2</sub> and N<sub>2</sub>.

9. The method of claim 8, wherein the GaN-based buffer layer is grown under a condition that flow of the sources of TMGa, TMin and TMAI is 5 - 300 μmol/min and growing pressure is 100 - 700 torr.

10. The method of claim 7, wherein the step (b) comprises the steps of:

- growing an Indium-doped GaN layer;
- growing an undoped GaN layer on the Indium-doped GaN layer; and
- growing a silicon-doped n-GaN layer on the undoped GaN layer.

11. The method of claim 7, wherein the step (b) comprises the steps of:

- growing an undoped GaN layer;
- growing an Indium-doped GaN layer on the undoped GaN layer; and
- growing a silicon-doped n-GaN layer on the Indium-doped GaN layer.